

Name :

Solution

Id :

Sec. # :

A particle of charge $3.1 \mu\text{C}$ is kept in a fixed position at a point P, and a second particle of mass 20 mg and the same charge is initially held a distance 0.9 mm from P. The second particle is then released. Determine the speed of the second particle when it is a distance 2.5 mm from the point P.

The mechanical energy is conserved

$$E_i = E_f$$

$$U_i = U_f + K$$

$$U_i = k \frac{q^2}{r_1} \quad ; \quad r_1 = 0.9 \text{ mm}$$

$$U_f = k \frac{q^2}{r_2} \quad ; \quad r_2 = 2.5 \text{ mm}$$

$$\Rightarrow K = U_i - U_f$$

$$\frac{1}{2} m v^2 = k q^2 \left(\frac{1}{r_1} - \frac{1}{r_2} \right)$$

$$\Rightarrow v = \sqrt{\frac{2kq^2}{m} \left(\frac{1}{r_1} - \frac{1}{r_2} \right)}$$

$$\Rightarrow v = 2.5 \times 10^3 \text{ m/s}$$

